

# Postoperative nausea and vomiting

Nausea and vomiting after surgery is common and can be both unpleasant and lead to an array of other adverse patient effects. Identification of high-risk patients and targeted prophylaxis can reduce its incidence and associated complications.

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## Background

Postoperative nausea and vomiting occurs in up to 30% of patients after surgery (Bayter et al, 2018). Postoperative nausea and vomiting is associated with increased parasympathetic activity, leading to pallor, hypersalivation, clamminess, bradycardia and hypotension.

## Complications

Postoperative nausea and vomiting can be extremely unpleasant for patients. It can also delay discharges, lead to readmissions, worsen pain and potentially lead to suture dehiscence, oesophageal rupture and aspiration of gastric contents.

## Risk factors

Risk factors for postoperative nausea and vomiting include patient, surgical and anaesthetic factors.

### Patient factors

- Female gender
- Previous postoperative nausea and vomiting or motion sickness
- Non-smoker
- Age – postoperative nausea and vomiting is more common in children (over 3 years of age) as they get older, while in adults the risk decreases with age
- Genetic predisposition.

### Surgical factors

- Gynaecological or gastrointestinal procedures
- Ocular or otological procedures
- Emergency surgery
- Acute gastrointestinal pathology.

### Anaesthetic factors

- Use of volatile anaesthetic gases or nitrous oxide
- Perioperative opioids (dose dependent)
- Use of anticholinesterase medications, such as neostigmine
- Duration of procedure.

Tools are available to predict the risk of postoperative nausea and vomiting, for example the Apfel score (Apfel et al, 1999), which looks for four predictive factors: female gender, history of postoperative nausea and vomiting or motion sickness, smoking status and use of opioids. With no risk factors, the risk of postoperative nausea and vomiting is 10%, rising to 20% with one, 40% with two, 60% for three and 80% for all four.

## Physiology, pathology and pharmacology

Vomiting is coordinated by the vomiting centre, an ill-defined area within the reticular formation of the medulla oblongata. The vomiting centre has multiple inputs (**Figure 1**),

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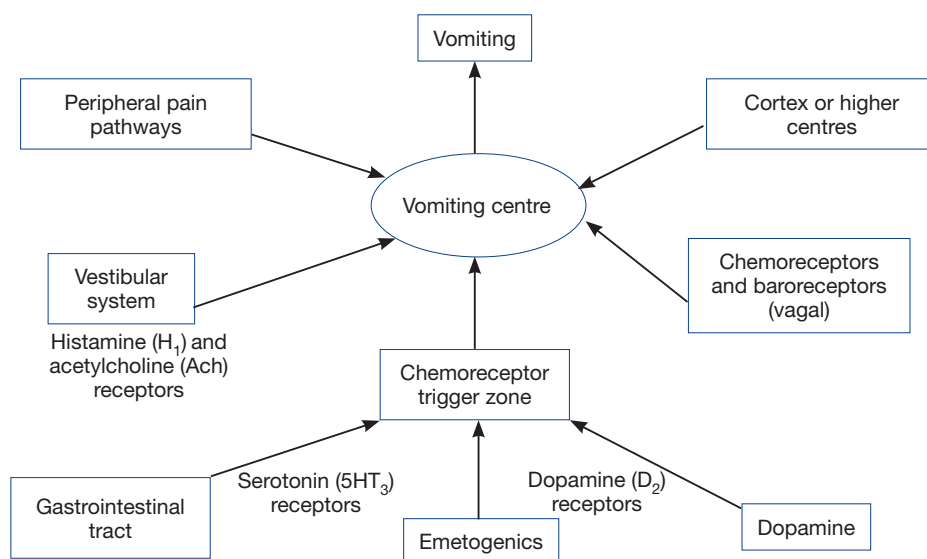


Figure 1. Postoperative nausea and vomiting pathways. From Anaesthesia UK (2004); Peck et al (2008).

Table 1. Treatments for postoperative nausea and vomiting			
Class of drug	Example	Mechanism of action	Notes
Anticholinergics	Hyoscine hydrobromide (Buscopan)	Antagonist at muscarinic receptors	Useful for nausea arising from vestibular system (eg ear surgery). Can cause anticholinergic side effects
Antihistamines	Cyclizine	Antagonist at histamine (H <sub>1</sub> ) receptors	Useful for nausea arising from vestibular pathways. Cyclizine also has antimuscarinic effects
Benzamides	Metoclopramide, domperidone	Antagonist at dopamine (D <sub>2</sub> ) receptors. Also some prokinetic effects	Most effective against chemoreceptor trigger zone-triggered vomiting (eg emetic chemicals or drugs) Metoclopramide crosses the blood–brain barrier and can cause extrapyramidal side effects May be avoided in some bowel surgeries (eg with new anastomosis)
Phenothiazines	Prochlorperazine (Stemetil)	Antagonist at dopamine (D <sub>2</sub> ) receptors	Also some serotonin (5HT <sub>3</sub> ) and muscarinic antagonist effects. Can cause extrapyramidal side effects
Butyrophenones	Haloperidol	Antagonist at dopamine (D <sub>2</sub> ) receptors	Also some serotonin (5HT <sub>3</sub> ) and muscarinic antagonist effects. Rarely used for antiemetic effects. Can cause QT prolongation
5HT <sub>3</sub> antagonists	Ondansetron	Antagonist at serotonin (5HT <sub>3</sub> ) receptors	Block receptors in the gastrointestinal tract and directly in the chemoreceptor trigger zone. Minimal side effects
Steroids	Dexamethasone	Unclear – possibly inhibition of prostaglandin activity	Highly effective antiemetic. Can cause perineal itching so best avoided in the awake patient. Reduce need for antiemetics for 72 hours postoperatively (DREAMS study)

From Gan et al (2014), DREAMS Trial Collaborators and West Midlands Research Collaborative (2017)

with multiple neurotransmitters and receptors involved in postoperative nausea and vomiting. Given the multiple pathways involved in postoperative nausea and vomiting, there are many different treatment options (Table 1). Other drugs with antiemetic effects include propofol, NK-1 receptor antagonists (eg aprepitant), alpha-2 receptor agonists (eg clonidine), mirtazapine, midazolam, cannabinoid (eg nabilone) and gabapentin (Peck et al, 2008; Gan et al, 2014).

Prevention and treatment of postoperative nausea and vomiting often requires a multimodal approach. The incidence is reduced significantly if a perioperative antiemetic is administered, with the rate showing further reduction with use of a second and third drug (Apfel et al, 2004). It is therefore common practice to administer multiple antiemetics to patients undergoing general anaesthesia.

## Management and prevention

Alongside use of multimodal antiemetics, other measures to avoid postoperative nausea and vomiting include avoiding general anaesthesia (eg by using a regional technique), using propofol infusion instead of volatile anaesthetics for general anaesthesia, minimising opioid use and avoiding the use of anticholinesterases.

## Conclusions

Postoperative nausea and vomiting is common and can be severe, leading to patient distress, prolonged admission and surgical complications. With careful planning, at-risk patients can be identified and strategies used to minimise the risk of postoperative nausea and vomiting. When postoperative nausea and vomiting does occur there are various treatment options that can be used.

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### Conflicts of interest

The author declares no conflicts of interest.

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